Eighth Grade

Fire in the Wildland-Urban Interface

Introduction

Good morning/afternoon. My name is _____ _____, and I work for the _____ National Forest. Today we are going to be talking about wildland fire. More specifically, we are going to be talking about fires in the wildland-urban interface.

Lesson

Every year many families lose their homes and possessions to the ravages of fire. Have any of you known people who lost their homes to fire? (Allow students to give some examples.) How about a wildfire? (Allow students to respond.)

Much of the Southwest is considered a high-hazard fire environment. Based on recent history, we know that our area has all the things necessary to support large, intense and dangerous wildland fires. As the number of people living in and adjacent to wildlands grows, the likelihood of homes being threatened by wildfire also grows.

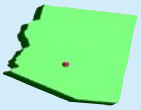
Have any of you heard the term wildland-urban interface? What does that mean? (Give students the opportunity to answer.) The WUI, as we call it, is the area where human development meets the undeveloped wildlands. We are especially concerned about fires in these areas because they threaten lives, homes and property.

This is what we call the Fire in the WUI Equation (write this on the board and draw little, fun graphics to go along): A (Fire) + B (People) + C (Increasing fire starts) + D (Larger, more intense fires) = E (Greater loss of life, homes and property)

Forest Service Messages

B-2: Public lands are unique, valuable resources for which the public has a shared responsibility in their care.
B-3: Human development near or within forest boundaries has a long-lasting effect and brings risks and obligations.
B-4: The complexity of managing our public lands is compounded by the numbers of people living near or within our boundaries and the increasing demands from public land users.
B-5: There are limits to sustainable development.

Academic Standards



Arizona Standards

SCIENCE

3SC-E2: Develop and use a systematic approach to analyze the risks associated with natural and biological hazards
PO 1: Analyze the risk factors associated with natural and biological hazards
3SC-E3: Identify a specific need and propose a solution or product that addresses this need, taking into consideration various factors
PO 1: Design a solution or product that addresses a need and considers the factors of an environmental or human problem
3SC-E4: Implement a proposed solution or design and evaluate its merit
PO 1: Apply a proposed solution to a problem
3SC-P2: Propose and test, using computer software or common materials a solution to an existing problem; or design a product to meet a need, using a model or simulation
PO 2: Propose a solution to the problem or design a product to meet the need

SOCIAL STUDIES

3SS-E2: Describe the impact of interactions between people and the natural environment on the development of places and regions in Arizona, including how people have adapted to and modified the environment, with emphasis on:
PO 4: how people have depended on the physical environment and its natural resources to satisfy their basic needs, including the consequences of Arizonans'

(Then, read the following and involve the students as you go.)

A = Fire is a natural part of our environment. (Fire was here long before we were. In fact, in the Southwestern ponderosa pine ecosystem, researchers have shown that fires burned through areas every 2 to 12 years.)
B = More and more people are living in this environment. (People like to live near the forest, so they build homes here. Many homes are built and maintained without regard to wildfire.)
C = There is a greater chance of fires starting. (With more people using our wildlands, more fire ignitions are likely. What are some ways people may start fires? Examples: campfires, cigarettes, matches, etc.)

This photo was taken on the Kaibab National Forest during a prescribed burn in the wildland-urban interface. In the background, there is a school. Prescribed burns are conducted in the wildland-urban interface in order to reduce the risk of high-intensity, destructive wildland fires.

D = Today's wildfires can burn intensely and be difficult to control. (Fires in the Southwest are bigger and more dangerous than they used to be. That's because when people moved into the forests, they decided to put out all those natural fires that were occurring. The problem was that without those fires, the fuels in the forest – such as pine needles, brush and trees – started to build up. So now when a fire starts, it has so much fuel that it burns more intensely and grows more rapidly.)
E = Greater loss of life; increased property losses; damage to natural resources; more money spent on firefighting. (Instead of doing positive things for the forest like fires used to do, some fires today are causing a lot of damage because of their high intensities. Can you think of some negative things that high-intensity wildfires can do? Examples: destroy all the trees; destroy wildlife habitat; kill animals and people; burn down homes, etc. Can you think of some positive things that lower-intensity wildfires can do? Examples: release nutrients into the soil; clean up accumulated fuels in the forest; stimulate new grasses to grow, which will attract wildlife, etc.)

adaptation to, and modification of, the natural environment

LANGUAGE ARTS

W-E1: Use correct spelling, punctuation, capitalization, grammar and usage, along with varied sentence structure and paragraph organization, to complete effectively a variety of writing tasks
PO 1: Spell correctly
PO 2: Punctuate correctly (e.g., sentence endings, commas in a series, commas in compound sentences, abbreviations, quotation marks, colon in a business letter greeting, apostrophes)
PO 3: Apply rules of capitalization (e.g., sentence beginnings, titles, abbreviations, proper nouns, direct quotations)
PO 4: Apply standard grammar and usage (e.g., subject-verb agreement; simple, compound and complex sentences; appropriate verb tense; plurals; prepositions)
PO 5: Organize paragraphs with a variety of sentence structures (e.g., simple, compound, complex)
W-E6: Write formal communications, such as personal or business letters, messages, directions and applications, in an appropriate format and for a specific audience and purpose
PO 1: Write a formal communication in an appropriate format for a specific audience and purpose
PO 2: Organize ideas in a meaningful sequence using smooth transitions
PO 3: Express ideas that are clear and directly related to the topic

New Mexico Standards

SCIENCE

Strand I: Scientific Thinking and Practice

Standard I: Understand the processes of scientific investigations and use inquiry and scientific ways of observing, experimenting, predicting, and validating to think critically.
5-8 Benchmark I: Use scientific methods to develop questions, design and conduct experiments using appropriate technologies, analyze and evaluate results, make predictions, and communicate findings.
Grade 8 Performance Standards
2. Use a variety of technologies to gather, analyze and interpret scientific data.
5-8 Benchmark II: Understand the processes of scientific investigation and how scientific inquiry results in scientific knowledge.
Grade 8 Performance Standards

Now that we know more about why wildfires in the WUI can be scary, let's talk about things that can be done to reduce fire risk. Any ideas?

Let's start by assessing the safety of homes in the WUI.

(This part of the lesson is derived from "Where Growth Meets Growth" of Nova Activity Fire Wars, http://www.pbs.org/wgbh/nova/teachers/activities/pdf/2908_fire_01.pdf.)

- Organize students into teams. Give each team copies of the "Where Growth Meets Growth" activity sheets and colored pencils.
- Have students identify, number and provide reasons for areas of increased risk they think should be changed.
- Have students consider changes that may mean adding or taking something away from the property that is not currently featured in the illustration.
- When teams are finished, compile everyone's results on the chalkboard and review them.
- Discuss the changes and why they should be made. Which changes would the students make first and why?
- Use the "Where Growth Meets Growth" answer sheet to identify changes that should be made that students might have missed. Print this page for answers: http://www.pbs.org/wgbh/nova/teachers/activities/2908_fire.html

(As an extension that the class could do now or later, have students survey and identify areas of their towns that may be most at risk for fire.)

Activity #1

(There are two activities offered in the Eighth Grade program. You can select one or the other or both depending on time and resources. This first activity requires use of the "Burning Issues" CD-ROMS. Computer requirements: Adobe Acrobat 3.0 or higher, QuickTime 3.0 or higher, 4X CD-ROM player. If these aren't on the computer, they need to be loaded from the CD. Be sure that you have sound on the computer. Use one computer, a projector and a screen so the class can all work together.)

Now, we are going to use everything we have learned to decide where and how we want to build a home in the WUI. We are going to do this using a program called "Burning Issues."

1. Examine alternative explanations for observations.
2. Describe ways in which science differs from other ways of knowing and from other bodies of knowledge (e.g., experimentation, logical arguments, skepticism).
3. Know that scientific knowledge is built on questions posed as testable hypotheses, which are tested until the results are accepted by peers.

5-8 Benchmark III: Use mathematical ideas, tools, and techniques to understand scientific knowledge.

Grade 8 Performance Standards

2. Create models to describe phenomena.

Strand II: Content of Science

Standard II (Life Science): Understand the properties, structures, and processes of living things and the interdependence of living things and their environments.

5-8 Benchmark I: Explain the diverse structures and functions of living things and the complex relationships between living things and their environments.

Grade 8 Performance Standards

2. Describe how energy flows through ecosystems (e.g. sunlight, green plants, food for animals).
3. Explain how a change in the flow of energy can impact an ecosystem (e.g. the amount of sunlight available for plant growth, global climate change).

5-8 Benchmark I-D (Skills): Research historical events and people from a variety of perspectives.

Grade 8 Performance Standards

1. Understand and apply the problem-solving skills for historical research, to include:
   - use of primary and secondary sources sequencing posing questions to be answered by historical inquiry
   - collecting, interpreting, and applying information gathering and validating materials that present a variety of perspectives.

Strand: Geography

Content Standard II: Students understand how physical, natural, and cultural processes influence where people live, the ways in which people live, and how societies interact with one another and their environments.

5-8 Benchmark II-C: Understand how human behavior impacts man-made and natural environments, recognizes past and present results, and predicts potential changes.

(These instructions are from "Burning Issues" Teachers' Workbook.)

- You will be accessing the Chaparral I-Zone for this particular activity.
- Start with My Computer.
- Then open Burn CD and double-click on Start.exe (Be patient. It may take a little time.)
- Play the Introduction.
- You are in the virtual Fire Center now, trapped in the hallway with three doors. Your only option is to enter the briefing room to get further instructions. (To scan, hold down left mouse button and move mouse. To zoom in, hold down Shift. To zoom out, hold down Ctrl.)
- Go through the Briefing Room door. Listen to the welcome.
- Click on a chair. Listen to the introduction and instructions.
- Exit the room to the hallway.
- Go through the door to the airfield. (E-R-I-F in order to get through.)
- Click on the Small Plane to get to the Chaparral I-Zone.

As we have already learned, the area where wildlands and human activities merge is often called the wildland-urban interface or, on this CD, the I-Zone. In this EcoVenture you will learn about the chaparral ecosystem and how people are moving into areas that were maintained by a natural fire regime. The activities involve the challenges of building and sustaining homes in areas where wildland fires occur. Some of the things you do are:

- select a FIREWISE building site,
- construct a FIREWISE home, and
- design FIREWISE landscaping around the home.

Most homeowners don't understand the natural cycle of wildfire and don't realize they are living in an area "designed" by nature to burn. Agency fire services are not always able to protect homes during wildland fires. Homeowners, community planners, fire agencies and others must work together to reduce these risks to homeowners and firefighters, and to prevent the loss of homes and structures. Before building a home and selecting a site, ask yourself, "Before the fire comes, have I done everything I could to protect my home and family?".

Grade 8 Performance Standards

1. Explain and evaluate how changing perceptions of place and the natural environment have affected human behavior

5-8 Benchmark II-D: Explain how physical processes shape the Earth's surface patterns and biosystems.

Grade 8 Performance Standards

1. Explain how human activities and physical processes influence change in ecosystems.

5-8 Benchmark II-F: Understand the effects of interactions between human and natural systems in terms of changes in meaning, use, distribution, and relative importance of resources.

Grade 8 Performance Standards

1. Describe the differing viewpoints that individuals and groups have with respect to the use of resources.

LANGUAGE ARTS

Strand: Reading and Listening for Comprehension

Content Standard I: Students will apply strategies and skills to comprehend information that is read, heard, and viewed.

5-8 Benchmark I-A: Listen to, read, react to, and interpret information

Grade 8 Performance Standards

1. Narrate a personal account that:
   - establishes a point of view and sharpens focus
   - uses remembered feelings
   - selects details that best illuminate the topic
   - connects events to self and society
2. Interact in group activities and/or seminars to:
   - share personal reactions to questions raised
   - give reasons and cite examples from texts to support opinions
   - clarify, illustrate, or expand on a response
   - ask classmates for similar expansion
3. Compare, contrast, and evaluate for details, main ideas, themes, actions, and main character from oral selections.

Strand: Reading and Listening for Comprehension

Content Standard I: Students will apply strategies and skills to comprehend information that is read, heard, and viewed.

5-8 Benchmark I-B: Gather and use information for research and other purposes

Grade 8 Performance Standards

1. Use information for specific tasks by:
   - analyzing and evaluating information to extend ideas

An area burned by fire on the Prescott National Forest. More and more people are choosing to live in areas that historically burned at regular intervals.

- Divide students into three groups. Explain that they are all going to have a part in building "their" house. Hopefully it will be a FIREWISE house.
- Group 1 is going to select a building lot in the chaparral "neighborhood".
- Group 2 is going to decide what building materials to use to construct your house.
- Group 3 is going to landscape your house.
- Group 1:
  - As you and the rest of the class look at the picture on the screen, I'm going to tell you a little about the neighborhood. This site is located in California's chaparral ecosystem. People have modified this area's vegetation by planting trees and other plants. Keep in mind trees are not always good indicators of the most dangerous fuels. Small diameter fuels, such as brush and grass, burn fiercely. Look at the potential building sites extending from the edge of town into the surrounding countryside. These sites extend along the street, out into the valley and up the side of the mountain.
  - Use the overlays to see the city water supply, electrical grid, existing streets and the topography. Spend a little time switching between overlays.
  - Tell Groups 2 and 3 that even though this isn't "their" activity, they should be thinking about where they would select a building lot.
  - After Group 1 has become familiar with the neighborhood, have them select a building lot to begin constructing their new home. The most FIREWISE sites are assigned a Survivability Factor of 30 points. Now that they have picked a possible building site, have them review the overlays again and tell them it's not too late to choose another site!

- analyzing and evaluating themes and central ideas in relation to personal and societal issues
- creating a research product in both written and presentation form

2. Use images, videos, and visual representations as informational research tools.

5-8 Benchmark I-C: Apply critical thinking skills to analyze information

Grade 8 Performance Standards

1. Create a research product in both written and presentation form by:
   - determining purpose, audience, and context
   - choosing a relevant topic
   - selecting a presentation format (e.g., video, essay, interactive technology)
   - evaluating information for extraneous detail, inconsistencies, relevant facts, and organization
   - researching and organizing information to achieve purpose using notes and memory aides to structure information
   - supporting ideas with examples, definitions, analogies, and direct references to primary and secondary sources
   - citing sources used
   - employing graphics, charts, diagrams, and graphs to enhance communication
2. Analyze the inferences and conclusions from fictional and non-fictional contexts, events, characters, settings, and themes.

Strand: Writing and Speaking for Expression

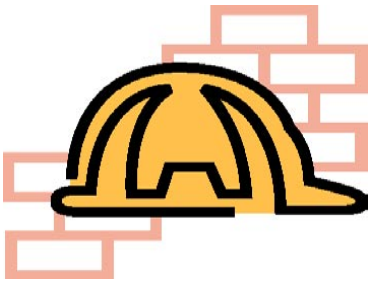
Content Standard II: Students will communicate effectively through speaking and writing.

5-8 Benchmark II-A: Use speaking as an interpersonal communication tool.

Grade 8 Performance Standards

1. Present similar content for various purposes and to different audiences showing appropriate changes in delivery.
2. Create and present arguments that persuade by:
   - engaging the audience by establishing a context, creating a persona, and developing interest
   - developing an idea that makes a clear and informed conclusion
   - arranging details, reasons, and examples persuasively
   - anticipating and addressing reader/listener concerns and counter-arguments

- Have them explain why they chose the lot they did. Listen to their reasons. As the presenter, you have a list of possible reasons for not choosing a building lot. Some of these are:
  - away from the city water supply (relying on electric pumps to supply water during a fire is risky due to the possibility of the electrical supply being interrupted during this emergency),
  - outside the boundaries of the local fire department and having reduced fire protection services,
  - on a steep slope (fire traveling up a slope will move faster and have longer flames. A fire on a 30 percent slope will have flames up to twice the length and travel as much as one and a half times as fast as a fire on flat ground),



  - on a road too narrow or steep for fire equipment or evacuation,
  - in an area where alternate escape routes are not available,
  - in a ravine or canyon which serves as a natural chimney, and
  - near highly flammable landscape or wildland vegetation (flame lengths can exceed 30 meters; radiated heat can ignite combustible materials from distances 30 meters or more).
- Discuss as class: Why did some lots have a lower Survivability Factor than others?

• **Group 2:**
- Hand out the "Table 1. House Survivability" sheet to each group. Explain to them that they are to record points as they make building decisions. Points will be added when they make a FIREWISE decision and subtracted when they make a risky decision.
- Click on "Build House" to begin construction.
- Select materials for the house from the options provided.
- Keep a careful record of choices in Table 1.
- Have Group 2 discuss their choices with the rest of the class.

• **Group 3:**
- Select materials for landscaping from the options provided.

CAREER READINESS

Standard 5: Students will develop effective leadership, interpersonal, and team skills.

5-8 Benchmark: 1. Students will explore the positive and negative implications of team work.

Forest Service Conservation Education Learner Guidelines

Program title: Fire in the Wildland-Urban Interface
Target audience: Eighth Grade
Primary topic: Living in the wildland-urban interface brings responsibilities.

Length of program: 1 to 1.25 hours

Setting: indoors

Guidelines addressed are referenced here:

5-8
I. Questioning and Analysis Skills
A1, A3, B2, C1, C3, E3, F2, G2,
G3, G4
II. Knowledge of Environmental Processes and Systems
1. A2, C1
2. A1
3. A1, B2, E2
4. B2, C4, D1, D2
III. Skills for Understanding and Addressing Environmental Issues
1. A1, A3, B1, B2, B3, C2, C3
2. A1, A2, A3, B1, D1
IV. Personal and Civic Responsibility
A3, C1, C3, C4

- Keep a careful record of choices in Table 1.
- Have Group 3 discuss their choices with the rest of the class.

• Ask the class if they can think of reasons why people might build homes with a low Survivability Factor. (Examples: Not aware of risks; Cost; Etc.)

Activity #2

(This activity can be done instead of Activity #1. This activity borrowed from "Activity 8-2. Houses in the Woods" from "FireWorks Curriculum: Featuring Ponderosa, Lodgepole, and Whitebark Pine Forests," http://www.fs.fed.us/rm/pubs/rmrs_gtr65.pdf.)

• Explain that students will use what they know about fire in evaluating the safety of homes that have been built in wildland areas.
• Break the students into groups. Have the groups use the photo prints in the "People in Fire's Homeland" kit.
• With the students, review "Safety in Fire's Homeland" (Student Page 24). Give each group a copy. Ask the students to identify and discuss what they have learned about fire that supports the points mentioned in the checklist.
• Explain to the students that they may not be able to answer every question for every picture, because each photo shows only some of the features of the checklist. It's all right to check "Can't Tell" on the safety checklist.
• Have groups begin their work. Use Tables 12 and 13 to help guide discussions within the groups.
• Ask the groups to report their findings to the rest of the class.
• Ask the whole class: Do you think any homes in your neighborhoods need some work to improve their safety?

Closing

I really enjoyed being here with you today. I hope you learned a lot about Fire in the Wildland-Urban Interface.

Handout

"Burning Issues" CD-ROM (one per class)

Supplies

• "Where Growth Meets Growth" activity sheets (one per team)
http://www.pbs.org/wgbh/nova/teachers/activities/pdf/2908_fire_01.pdf
• Colored pencils (one set per team)
• **Activity #1:**
  - Computer
  - Projector
  - Screen
  - "Burning Issues" CD-ROM (two – one for activity and one to leave for class)
  - "Table 1. House Survivability" sheets (one per group)
    This worksheet is found in Section IV Chaparral I-Zone of the Teacher and Student Guides to the "Burning Issues" CD-ROM (these guides are on the CD-ROM)
• **Activity #2:**
  - "Safety in Fire's Homeland" (Student Page 24) sheets (one per group)
  - "People in Fire's Homeland" Kit (one per group)
    This kit is from "Activity 8-2. Houses in the Woods" from "FireWorks Curriculum: Featuring Ponderosa, Lodgepole, and Whitebark Pine Forests," http://www.fs.fed.us/rm/pubs/rmrs_gtr65.pdf.)
  - Copy of Tables 12 (Relationship of safety checklist to concepts covered by FireWorks) and 13 (Assessment of fire hazards around wildland homes) from "Activity 8-2. Houses in the Woods" from FireWorks Curriculum

Safety in Fire's Homeland

Name _____

Photo Number: _____

Put a check in the "yes," "no," or "can't tell" column.

		Yes!	No!	Can't tell
About the House:				
1	Is the roof covered with metal or asphalt shingles (not wood shakes)?			
2	Are firewood and other wood stored away from the house, not touching walls or deck?			
3	Are weeds cleared away from the sides of the house?			
4	Are tree limbs cleared away from roof and chimney?			
5	Are dead leaves and needles cleaned from roof and rain gutters?			
Around the House (safety zone, within 10 m):				
6	Are trees and shrubs 5 m apart or more?			
7	Are ladder fuels and low branches cleared from underneath big trees?			
8	Is the lawn kept green, even in late summer?			
9	If the house is at the top of a slope, is the safety zone 30 m or more?			
About the Location:				
10	Is the house on a flat place, set back from the top of a slope?			
11	Is the road wide enough for a car going out to pass a fire engine coming in?			
Count the checks in each column:				

Table 12—Relationship of safety checklist (Student Page 24) to concepts covered by *FireWorks*.

No.	Safety Checklist Point	*FireWorks* concepts
1	Is the roof metal or shingle? NOTE that home photo 2 shows shakes, 4 shows shingles, and 9 shows metal roofing.	Fires need fuel. Wood shakes, especially untreated ones, are great fuel.
2	Is firewood and other wood stored away from the house, not touching walls or deck?	Although big logs would be hard to ignite, they would burn long and hot.
3	Are weeds cleared away from the sides of the house?	Weeds dry out in late summer. Dead, dry, "fluffy" material burns easily.
4	Are tree limbs cleared from the roof and around the chimney?	A single match can start a fire. So can a spark from a chimney.
5	Are dead leaves and needles cleaned from the roof and rain gutters?	Fire needs fuel. Dead leaves and needles burn well.
6	Are trees and shrubs 5 m apart or more?	For fire to spread, heat must reach new fuels.
7	Are "ladder fuels" and low branches cleared from underneath big trees?	Heat rises. Saplings and low branches increase chance of crown fire.
8	Is the lawn watered and green, even in late summer?	Green fuels burn less readily than dead, dry fuels.
9	If the house is at the top of a slope, is the "safety zone" 30 m or more?	Heat rises....
10	Is the house on a flat place, or set back from the top of a slope?	Heat rises....
11	Is the road wide enough for a car going out to pass a fire engine going in?	

Table 13—Assessment of fire hazards around wildland homes in *People in Fire's Homeland* Kit. Numbers in the table refer to numbered safety criteria in table 12. Question marks indicate that the criterion was difficult or impossible to assess from the photo.

Home No.	"Yes!"—Looks safe because...	"No"—Needs improvement because...	Can't tell or doesn't apply
1	2, 3, 5, 6(?), 8, 10	1, 4(?), 7	9, 11
2	2(?), 5, 8(?), 10	1, 3, 4, 6, 7	9, 11
3	8, 10	1(?), 2, 3(?), 4, 5, 6, 7	9, 11
4	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	none	none
5	10(?)	3, 4, 6, 7, 8	1, 2, 5, 9, 11
6	3, 4(?), 7, 10	1, 2, 5, 6, 8	9, 11
7	1, 2(?), 4, 5, 6, 7, 10	3, 8	9, 11
8	1(?), 2, 10	3, 4, 5, 6, 7, 8	9, 11
9	1, 3, 5, 10	2, 6, 7, 8	4, 9, 11
10	2(?), 4, 8	3(?), 7, 9, 10	1, 5, 6, 11
11	1, 2, 3, 4, 5, 6, 7, 8, 11(?)	none	9, 10